# 3.1 Optomechanical systems (1)

- **Scientific and engineering resources are available to carry out the optomechanical work on DECam. The highly distributed organization of this effort will require good managerial and systems engineering controls.**
  - These need to be in place as soon as possible if the schedule to CD2 is to be maintained.
- **Early prototyping and the adaptation of existing designs give confidence that the engineering solutions being developed will work in the production camera.**
  - Examples: camera focal plane assembly, barrel assembly, shutter and filter mechanisms (PanSTARRS).
- **The telescope simulator, while costly, will allow essential testing of the mechanics of the optomechanical assembly including the vane interface to the telescope structure prior to shipment to Chile.**
- **Costs and schedules are deemed credible particularly where backed up by vendor ROMS and experience with prototypes with the caveat that the additional systems engineering required to reach CD2 will challenge the schedule.**

# 3.1 Optomechanical systems (2)

- **The optical design of the corrector satisfies the project imaging requirements.**
  - No ADC is required for the DES but non-DES programs with wide-band coverage in the blue could be affected by dispersion. However, the addition of an ADC would significantly complicate the DECam design and be costly. No change is recommended.
- **The need for an external light shield around the barrel assembly is unclear and the shield will inhibit passive cooling of the barrel and service access.**
- **The options for corrector lens testing during polishing involve a trade off between risk and cost taking into account expected index uniformity of the fused Si for blanks.**
  - This needs to be decided by the project. DES received two quotes for polishing the corrector lenses: Sagem for $918K and SESO for $656K. SAGEM proposes to test the lenses in transmission while SESO will only test surface figure.
- **The corrector lens alignment procedure proposed by UCL appears adequate at this stage of the project.**

# 3.1 Optomechanical systems (3)

- **DES's plan to build equipment to independently measure filter throughput and band pass is an essential to the QA process for acceptance and for monitoring filter performance over time.**
  - Risk: the DES filters are 30% larger than the largest-ever SDSS filters produced for PanStarrs.
- **The design of the corrector barrel is judged to be viable pending the final results of FEA analysis and final optimization.**
- **An FE analysis of DECam mounted at the top end of the Blanco telescope is required in order to assess the performance of combined structure at various assumed telescope orientations and to validate the design.**
  - This analysis is needed well before CD2.

# 3.1 Optomechanical systems (4)

- **The filter and shutter mechanisms are scaled up versions of similar devices produced for PanSTARRS.**
  - The DES units should be procured in time to allow thorough testing at various orientations on the DES simulator.
- **The detector cooling system will likely work as presented but a design using commercial components (e.g. Cryo-Tiger) may be simpler and significantly less expensive.** (Section 3.2)
- **The hexapod support was not demonstrated to meet the current positioning specifications with the specified combination of speed, resolution, stroke, and load capacity.**
  - Relaxation of DES specifications and/or further discussions with potential vendors may resolve this issue. On the other hand, an alternative slide type mechanism may provide the required 3 DOF motion with adequate resolution and speed, less complexity, and lower cost.

# 3.1 Optomechanical systems (5)

**Recommendations:**

1. Augment the systems engineering effort within the DECam group.
2. Perform a cost-benefit trade study of lens fabrication methodology (surface figure only versus transmission testing) for CD2.
3. Complete the FEA for the DECam structure and combined instrument/telescope assembly for CD2.
4. Re-examine the need for a light baffle enclosing the barrel assembly and delete if superfluous.
5. Resolve hexapod performance issues and consider alternative designs.